B5

26. (New) Method of manufacturing according to claim 20, comprising forming the rigid body with end portions constituted by reinforcing members with isotensoid surfaces of unidirectional curvature.

REMARKS

Careful consideration has been given to the Official Action of March 14, 2002 and reconsideration of the application as amended is respectfully requested.

The specification has been amended to provide section headings in accordance with 37 CFR 1.77.

The Examiner has rejected some claims in the application under 35 U.S.C. § 102 as being anticipated by Murphy and other claims on Murphy in combination with secondary references of Kepler and Reinhart. Claim 22 has been rejected under 35 U.S.C. § 103 on Murphy.

Amendatory action has been taken in the claims so that Murphy will no longer be applicable as an anticipatory reference or one applicable under 35 U.S.C. § 103. Claims 9-13 have been cancelled and the contents thereof have been incorporated into claims 15-18 wherein the strength of the vessel is related to a specific maximum pressure.

Claims 23-26 have been added as dependent claims.

Murphy is the closest prior art to the invention since it is directed to solving the problem of shear stress on the filament. Murphy also teaches a pressure vessel with a plastic liner having a geodesic dome surface extending between a diameter of the liner and a polar opening. The geodesic dome surface is defined by first and second oppositely curved surfaces of revolution of meridia joined by an inflection point. There are continuous polar windings of glass/carbon/aramid fibre filaments wound in an isotensoid pattern over the surface of the liner.

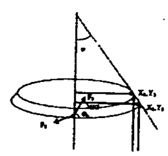
Murphy discloses the following solution to the stated problem of shear stress in the fibres; a first surface of revolution (= winding) curves from the liner diameter to a first point just unto but not at said inflection point. A second surface of revolution (=winding) curves from the polar opening to a second point just unto but not at said inflection point in a direction opposite to the curvature of the first surface of revolution. The first and second windings are joined (i.e. overwound), and the inflection point is traversed by a straight-line third winding which closely approximates geodesic curvature through the inflection point. There is no disclosure whatsoever either pro or con at dry-winding the filaments.

In short, Murphy is directed to <u>not</u> allowing the fibres to move freely with

respect to each other.

The question to answer is: does Murphy teach one skilled in the art that the filaments will remain in place without their having to be embedded or otherwise fixed in a matrix?

Considering the straight line surface of revolution as mentioned in claim 1 of Murphy (column 4, lines 28-30):



On the surface a fibre element is drawn, having a winding angle Q_2 at point X_2

according to equation 1 (see column 2) and a winding angle Q_3 according to equation 1 (see column 2) at point X_3. On the surface, *n* number of fibre elements can applied in a circumferential direction. Furthermore, since the line between points (X_2,Y_2) and (X_3,Y_3) is straight, the angle j is the same at both points.

Equilibrium of forces on an arbitrary surface that is perpendicular to the axis of revolution requires that in the Y-direction:

$$nF\cos\theta\cos\varphi = \pi p X^2$$

or

$$F = \frac{\pi p X^2}{n\cos\theta\cos\varphi}$$

wherein

n	=	number of fibres
F	=	force in the fibre
Q	=	winding angle
j	=	defines the slope of the straight line
p	=	internal hydrostatical pressure
X	=	radius

The absence of shear forces on the fibres implies that $F_2=F_3$:

or

$$\frac{\pi\rho X_2^2}{n\cos\theta_2\cos\varphi} = \frac{\pi\rho X_3^2}{n\cos\theta_3\cos\varphi}$$

$$\frac{X_2^2}{\cos\theta_2} = \frac{X_3^2}{\cos\theta_3}$$

Making use of

$$\sin^2\theta + \cos^2\theta = 1$$

and equation 1 (see column 2)

$$\sin\theta = \frac{d/2}{X}$$

with which one can derive:

$$\cos\theta = \sqrt{1 - \left(\frac{d/2}{X}\right)^2}$$

Substitution hereof yields:

$$\frac{X_2^2}{\sqrt{1-\left(\frac{\frac{d}{2}}{X_2}\right)^2}} = \frac{X_3^2}{\sqrt{1-\left(\frac{\frac{d}{2}}{X_3}\right)^2}}$$

which results in:

$$X_2 = X_3$$

<u>which is false</u>. Therefore, since $X_3 < X_2$ then $F_3 < F_2$. F_3 can only be smaller than F_2 when a load transfer takes place. This can only occur when shear loads act on the fibre. Shear loads can only act when a matrix is present. Therefore the straight line surface of revolution as mentioned by Murphy introduces shear loads on the fibres on that surface. **<u>The introduction of shear loads make the use of a matrix necessary</u>**.

It is thus respectfully submitted that in light of US-5526994 (Murphy) as the closest prior art, the subject-matter of the invention as claimed is novel, since Murphy does <u>not</u> teach the skilled person that the filaments (which are polar windings) will remain in place without their having to be embedded in a matrix. Bearing this in mind, and referring to GB-703811 (dry yarns applied only circumferentially about the cylinder wall in substantially unstretched condition), the skilled person will not be led towards the application of dry yarns in polar windings without the use of a matrix.

Therefore, even though Murphy does not specifically disclose in the patent that the fibres are embedded in a matrix it is respectfully submitted that the above demonstrates the need for a matrix to embed the fibres and they do not remain free for movement as claimed in the present application. Therefore, as now presented the claims are patentably distinguished from Murphy and the rest of the cited art.

Favorable reconsideration is therefore earnestly solicited.

Respectfully submitted,

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